Reg. No.															

Question Paper Code	13449

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Sixth Semester

Computer Science and Engineering

(Common to Electronics and Communication Engineering)

20CSOE903 - DATA STRUCTURES AND ALGORITHMS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following functions has the fastest growth rate as n increases?? (a) O(1) (b) O(log n) (c) O(n) (d) O(n^2)	1	K1	CO1
2.	What is the time complexity of Binary Search in the worst-case scenario? (a) O(n) (b) O(log n) (c) O(n log n) (d) O(1)	1	K1	CO1
3.	If an algorithm has time complexity O(n^2), what will happen to the execution time if the input size doubles? (a) It will double (b) It will become four times (c) It will stay the same (d) It will become half	1	K1	CO2
4.	Which type of queue allows elements to be added based on their importance rather than order of arrival? (a) Simple Queue (b) Circular Queue (c) Priority Queue (d) Dequeue	1	K1	CO2
5.	In a singly linked list, what does the last node's next pointer point to? (a) The head node (b) Itself (c) NULL (d) Random node	1	K1	CO3
6.	In a doubly linked list, each node contains (a) Only data (b) Data and one pointer (c) Data and two pointers (d) Data and three pointers	1	K1	CO3
7.	How many nodes are there in a full binary tree of height h? (a) 2^h (b) 2^h – 1 (c) 2^(h+1) – 1 (d) h	1	K1	CO4
8.	What is the main purpose of a threaded binary tree? (a) To balance the tree (b) To reduce memory usage (c) To make inorder traversal faster without using stack or recursion (d) To allow duplicate values	1	K1	CO4
9.	In a B-Tree of order m, what is the maximum number of children a node can have? (a) m (b) m-1 (c) m+1 (d) m/2	1	K1	CO5
10.	Which of the following sorting algorithms is the best choice when the input is almost sorted? (a) Selection Sort (b) Bubble Sort (c) Insertion Sort (d) Quick Sort	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Define Big-O notation with an example.	2	K2	CO1
12.	Write any two differences between Linear Search and Binary Search.	2	K2	CO1
13.	Define postfix expression. Give an example.	2	K2	CO2
14.	Define Queue.	2	K2	CO2
15.	What are the steps to traverse a singly linked list?	2	K2	CO3
16.	List two advantages of doubly linked list over singly linked list.	2	K2	CO3
17.	Define the terms "height of a tree" and "leaf node" with an example.	2	K2	CO4

18.	Give the difference between binary tree and binary search tree.	*2*	*K2*	*CO4*
19.	List the operations that can be performed on a binary tree.	*2*	*K2*	*CO5*
20.	Define a B-Tree.	*2*	*K2*	*CO5*
21.	Mention the important properties of a good sorting algorithm.	*2*	*K2*	*CO6*
22.	Define the terms degree of a vertex and path in a graph.	*2*	*K2*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain different types of Data Structure operations with suitable examples.	*11*	*K2*	*CO1*
		OR			
	b)	Describe the working of binary search algorithm with a suitable example.	*11*	*K2*	*CO1*
24.	a)	Write the algorithm to convert an infix expression to a postfix expression. Explain with a detailed step-by-step example.	*11*	*K2*	*CO2*
		OR			
	b)	Explain the algorithm for inserting and deleting elements in a priority queue implemented using an array.	*11*	*K2*	*CO2*
25.	a)	Explain the algorithm to insert a node at the beginning, at the end, and at a specific position in a singly linked list.	*11*	*K2*	*CO3*
		OR			
	b)	Describe the algorithm to insert and delete nodes in a circular linked list with examples.	*11*	*K2*	*CO3*
26.	a)	Explain all the operations that can be performed on a BST with examples.	*11*	*K3*	*CO4*
		OR			
	b)	Construct an AVL tree by inserting the following elements in sequence: 50, 30, 70, 20, 40, 60, 80, 10, 25, and 35. Show the tree after each insertion.	*11*	*K3*	*CO4*
27.	a)	Explain the insertion and deletion operations in a B-tree with suitable examples.	*11*	*K3*	*CO5*
		OR			
	b)	Construct a B+ tree of order 4 by inserting the following keys sequentially: 5, 15, 25, 35, 45, 55, 65, 75, 85, and 95. Show the B+ tree after each insertion.	*11*	*K3*	*CO5*
28.	a)	List the different types of hashing techniques? Explain them in detail with an example.	*11*	*K2*	*CO6*
		OR			
	b)	Explain DFS and BFS with examples and analyze their time complexities.	*11*	*K2*	*CO6*